

PATENT ABSTRACTS OF JAPAN

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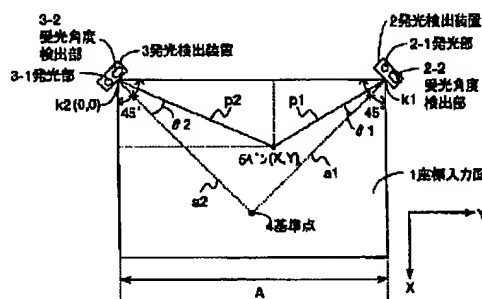
G06F 3/03(21) Application number: **08135057**(22) Date of filing: **29.05.96**(71) Applicant: **FUJITSU LTD**(72) Inventor: **NAKAZAWA FUMIHIKO
SANO SATOSHI
SAWAKI IPPEI**(54) **COORDINATE DETECTOR**

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a miniaturized high-reliability coordinate detector of simple configuration with no scan mechanism by arranging detectors having light emitting parts and light receiving parts more than two pairs at prescribed interval.

SOLUTION: Light emitting detectors 2 and 3 are fixedly installed at two adjacent corners k1 and k2 on a coordinate input plane 1 of a rectangular planar plate. Light is emitted from these two light emitting detectors 2 and 3 onto the coordinate input plane 1. A user instructs any arbitrary position on the coordinate input plane 1 while using a position instructing stick, namely, a pen 5. At such a time, the light emitting detectors 2 and 3 calculate the position coordinate of the pen 2 by detecting the light, which is reflected on the pen 5 and returned to the light emitting detectors 2 and 3, among the beams emitted from the light emitting detectors 2 and 3. The light emitting detectors 2 and 3 are installed toward the coordinate input plane 1 so that both the light emitting optical axis of light emitted from light emitting parts 2-1 and 3-1 and the light receiving optical axis of light receiving angle detecting parts 2-2 and 3-2 can be turned toward a reference point 4 on the coordinate input plane 1.

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CLAIMS

[Claim]

[Claim 1] It has 2 or more sets of photogenesis / detection meanses which consist of a position designation means to have the recurrence reflective section, and an angle detection means to detect the degree of carrier optic angle of the reflected light reflected through a photogenesis means and the aforementioned recurrence reflective section. Coordinate detection equipment 2 or more sets of whose photogenesis / detection meanses contiguity arrangement of the photogenesis means and the angle detection means of constituting one photogenesis / detection means is carried out so that both of each optical axis may turn to the center of abbreviation of a coordinate input area, and are mutually characterized by setting a predetermined spacing among the circumference section of a coordinate input area, and being arranged.

[Claim 2] Coordinate detection equipment of the claim 1 publication characterized by the aforementioned angle detection means being constituted from a photo detector which generates the signal corresponding to the degree of carrier optic angle of the aforementioned reflected light, and a condensing means to be ahead of this photo detector and to condense the reflected light by the position ****ed.

[Claim 3] The claim 1 characterized by having further the coordinate input plate of the shape of a 4 angle flat surface used as a coordinate input area, and equipping one angle of the aforementioned coordinate input plates with the 2 or more aforementioned sets of photogenesis / detection meanses, respectively, or coordinate detection equipment given in two.

[Claim 4] Coordinate detection equipment of the claim 1 publication characterized by equipping further the position from which it is the front and only the predetermined spacing separated to the orientation of the light of the aforementioned photogenesis means with the optical lens which is parallel to a coordinate input area side, and condenses the light from a photogenesis means in the shape of a sector.

[Claim 5] Coordinate detection equipment of the claim 1 publication characterized by having a time-sharing-control means further in order to make the photogenesis means of photogenesis / detection means of aforementioned each class emit light one by one by the predetermined time interval.

[Claim 6] Coordinate detection equipment of the claim 1 publication characterized by having further an operation means to calculate the position on the coordinate input area directed by the aforementioned position designation means, using two or more degrees of carrier optic angle detected by the angle detection means of photogenesis / detection means of aforementioned each class.

[Claim 7] Coordinate detection equipment of an one either [of the claims 1-6 characterized by having arranged two or more recurrence reflective sections to which the aforementioned position designation means is the designation rod of a pen configuration, and becomes the periphery of the point from a minute cube corner reflector] publication.

[Translation done.]

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TECHNICAL PROBLEM

[Object of the Invention] However, in some which detect a coordinate position by **** or electromagnetic induction, since the cable which a manufacturing cost is high and connects a pen and a mainframe since it has an electric switch function in a coordinate input side was required, the difficulty was in operability. Moreover, with the conventional coordinate position detection equipment which detects a coordinate position from a scan when carrying out the scan of the beam light and ****ing the reflected light, the device to which the scan of the beam light, such as a motor, is carried out is needed, and the reliability of a position detection is low, and the miniaturization of the whole equipment is difficult. Moreover, by moving a recurrence reflective sheet, the equipment equipped with the conventional photogenesis and the photo detector and this equipment do not direct the spatially distant position, and the coordinate detection equipment which consists of a recurrence reflective sheet arranged in the spatially distant position does not carry out a coordinate detection within a certain fixed flat surface.

[0006] This invention is made in consideration of the above points, and tends to offer the coordinate detection equipment with high small and reliability with an easy configuration in the coordinate detection equipment which directs the coordinate position within a certain fixed coordinate input side with a pen by setting the detection equipment which has 2 or more sets of the photogenesis sections and *****, and arranging a predetermined spacing, without having a scanning device.

[Translation done.]

[An easy explanation of a drawing]

[Drawing 1] It is the block diagram of one example of the coordinate detection equipment of this invention.

[Drawing 2] It is the conceptual diagram of the configuration of one example of the photogenesis detection equipment of this invention.

[Drawing 3] It is the conceptual diagram of the configuration of the photogenesis detection equipment using the aperture of this invention.

[Drawing 4] They are the cylindrical lens of one example of this invention, and the concrete plot plan of PSD.

[Drawing 5] They are the aperture of one example of this invention, and the concrete plot plan of PSD.

[Drawing 6] In one example of this invention, it is explanatory drawing of the condensing status of the beam of light by the optical lens.

[Drawing 7] It is the configuration block view of one example of the control circuit of this invention.

[Drawing 8] It is explanatory drawing of the point of the position designation rod used for this invention.

[Drawing 9] It is explanatory drawing of the configuration of a cube corner reflector.

[Drawing 10] In one example of this invention, it is the physical relationship view of a cylindrical lens and PSD.

[An explanation of a sign]

1 Coordinate Input Side

2 Photogenesis Detection Equipment

3 Photogenesis Detection Equipment

2-1 Photogenesis Section

2-2 The Degree Detecting Element of Carrier Optic Angle

3-1 Photogenesis Section

3-2 The Degree Detecting Element of Carrier Optic Angle

4 Reference Point

5 Pen

6 Light Source (Light Emitting Diode)

7 Optical Lens

8 PSD

9 Cylindrical Lens

10 Mask

11 Aperture

12 Transmitted Light

21 Amplifier

22 Analog Operating Circuit

23 A/D Converter

24 Light Emitting Diode Driver

25 ROM

26 RAM

27 MPU

28 Timer

29 Interface Driver

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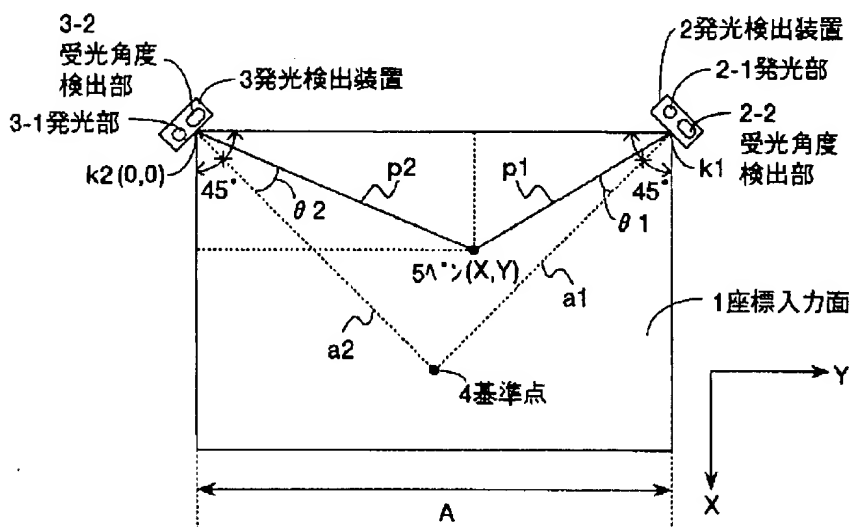
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DRAWINGS

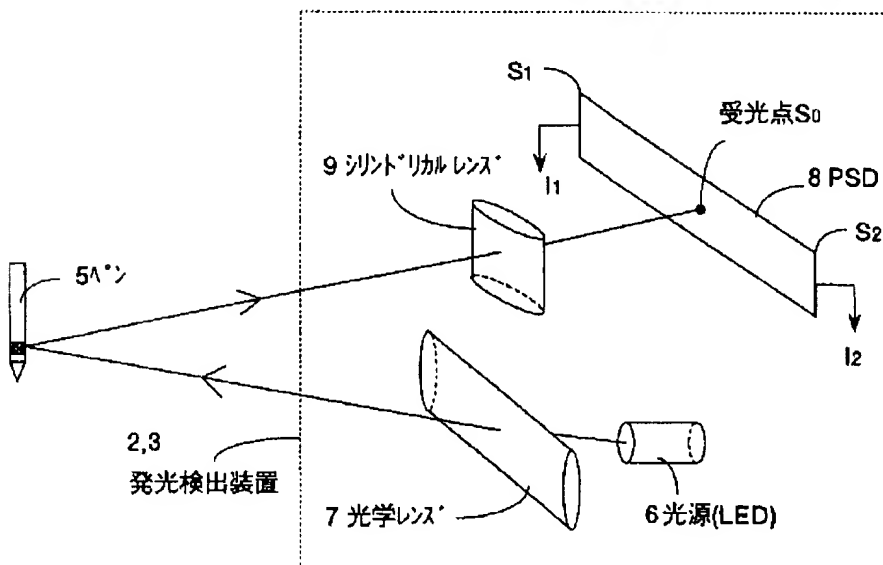
[Drawing 1]

この発明の座標検出装置の一実施例の構成図



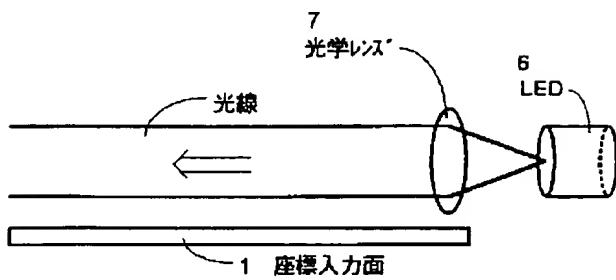
[Drawing 2]

この発明の発光検出装置の一実施例の構成図



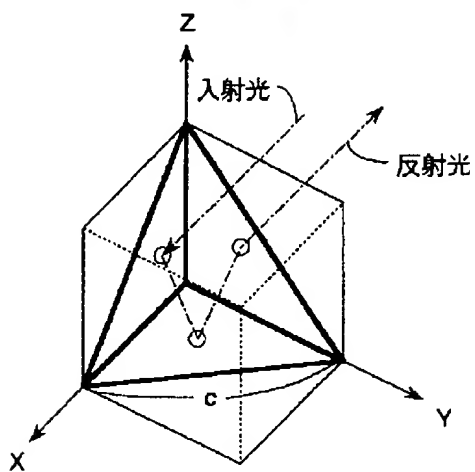
[Drawing 6]

この発明の発光された光の集光状況の説明図



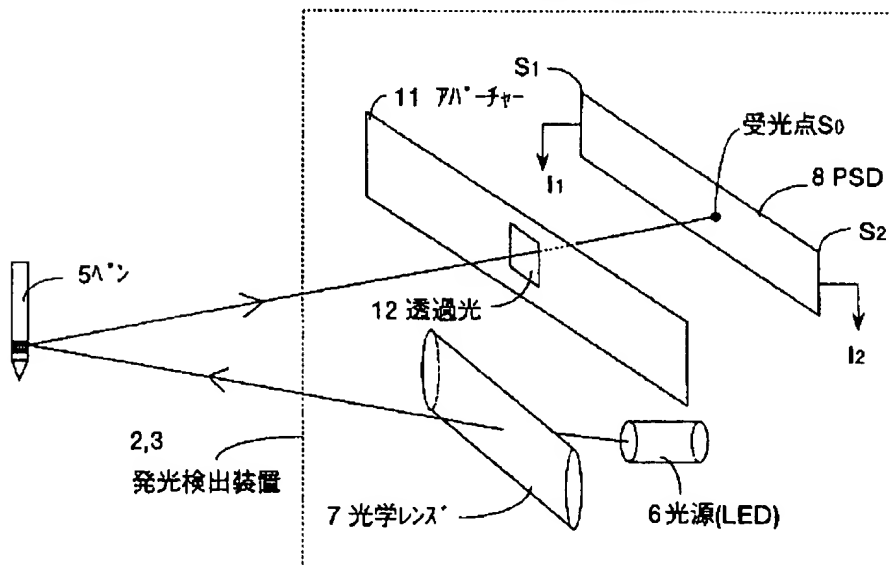
[Drawing 9]

この発明の入射光の先端部に用いられるコーナキューブの形状の説明図



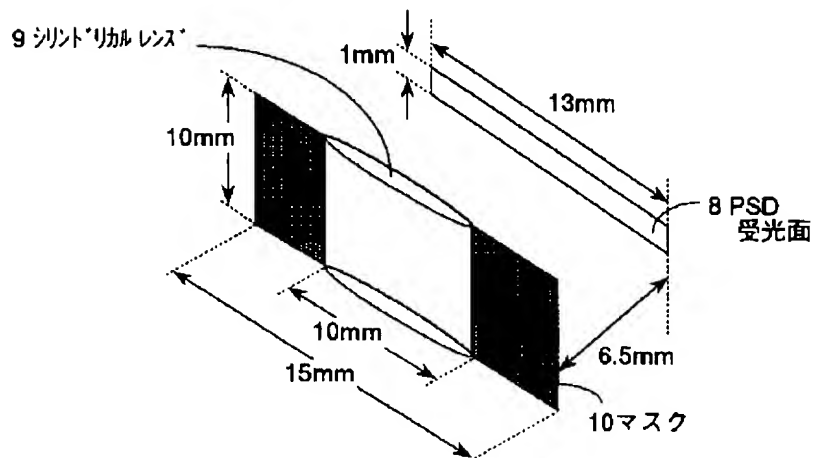
[Drawing 3]

この発明の発光検出装置の一実施例の構成図



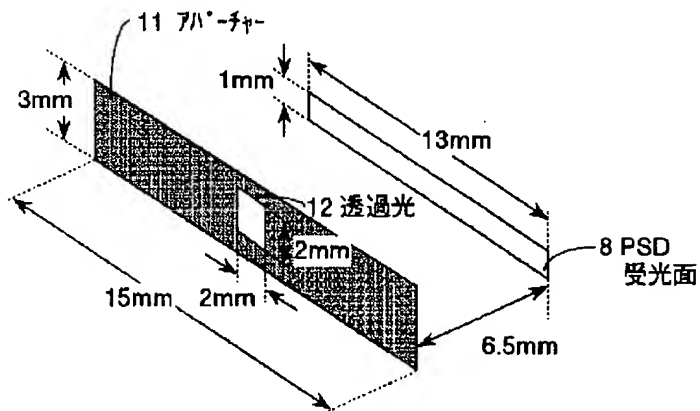
[Drawing 4]

この発明のシフトリカルレンズとPSDの配置図



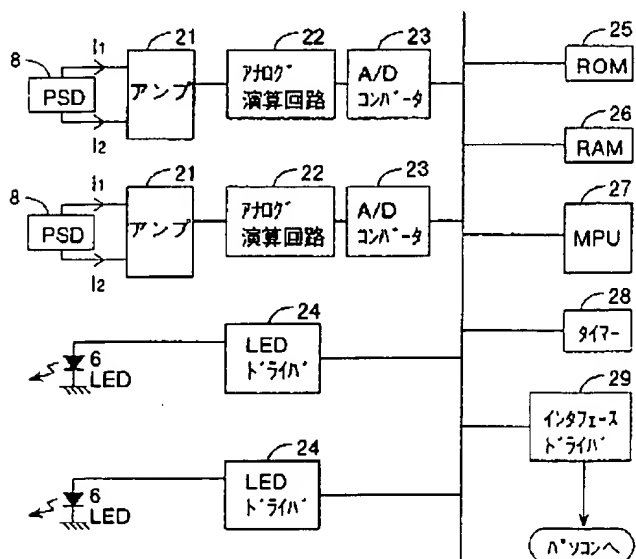
[Drawing 5]

この発明の7ハーフチャとPSDの配置図



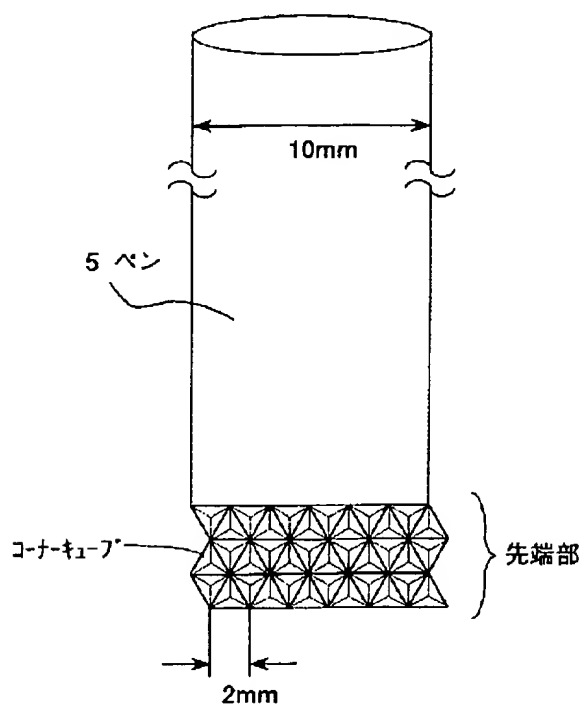
[Drawing 7]

この発明のLED及びPSDの制御回路の構成ブロック図



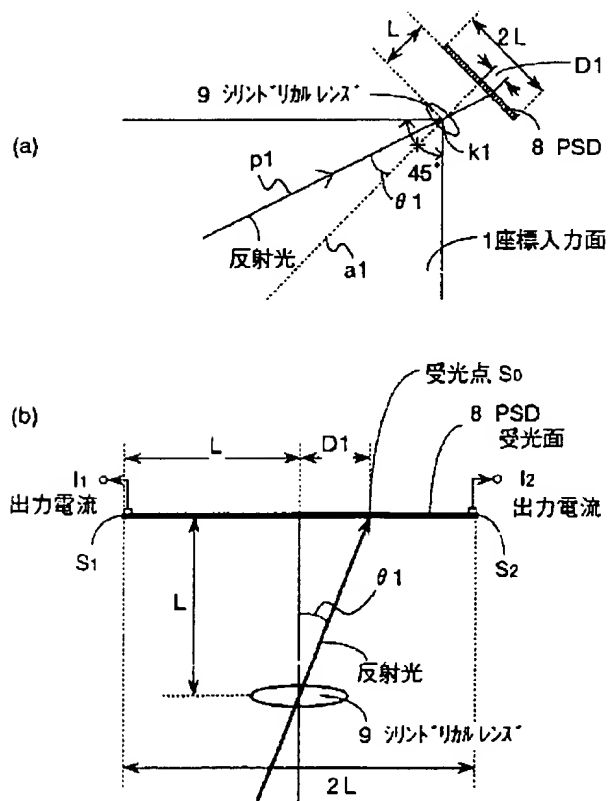
[Drawing 8]

この発明のペン先端部の形状の一実施例の説明図



[Drawing 10]

この発明のシントリカルレンズとPSDの位置関係図



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MEANS

[The means for solving a technical problem] This invention is equipped with 2 or more sets of photogenesis / detection meanses which consist of a position designation means to have the recurrence reflective section, and an angle detection means to detect the degree of carrier optic angle of the reflected light reflected through a photogenesis means and the aforementioned recurrence reflective section. Contiguity arrangement of the photogenesis means and the angle detection means of constituting one photogenesis / detection means is carried out so that both of each optical axis may turn to the center of abbreviation of a coordinate input area. 2 or more sets of photogenesis / detection meanses provide the circumference section of a coordinate input area with the coordinate detection equipment with which it is characterized by setting a predetermined spacing and being arranged mutually.

[0008] Moreover, in order to raise the reliability of the degree detection of carrier optic angle, as for the aforementioned angle detection means, it is desirable that a photo detector which generates the signal corresponding to the degree of carrier optic angle of the reflected light, and a condensing means to be ahead of this photo detector and to condense the reflected light are consisted of by the position by which the reflected light is ****ed. Here, the aperture which has an optical lens or a minute slit can be used for the aforementioned condensing means.

[0009] This invention is good also as a configuration by which it had further the coordinate input plate of the shape of a flat surface used as a coordinate input area, and this input plate is 4 square shapes-like, and one angle of the coordinate input plates was equipped with the 2 or more aforementioned sets of photogenesis / detection meanses, respectively. Moreover, you may equip further the position from which it is the front and only the predetermined spacing separated to the orientation of the light of the aforementioned photogenesis means with the optical lens which is parallel to a coordinate input area side, and condenses the light from a photogenesis means in the shape of a sector. In order to raise the reliability of the degree detection of carrier optic angle, you may have further a time-sharing-control means to make the photogenesis means of photogenesis / detection means of aforementioned each class emit light one by one by the predetermined time interval. Moreover, in having further the display with which a display front face serves as a coordinate input area, in order to prevent a malfunctioning, it is desirable to arrange an infrared cut filter on a display front face.

[0010] Furthermore, this invention offers the coordinate detection equipment further equipped with an operation means to calculate the position on the coordinate input area directed by the aforementioned position designation means using two or more degrees of carrier optic angle detected by the degree detection means of carrier optic angle of the photogenesis detection means of aforementioned each class.

[0011] Here, as for a position designation means, it is desirable to carry out the usually same configuration as a writing implement, and what is necessary is just a long and slender configuration like the so-called pen. Hereafter, a position designation means is called pen. Moreover, in order to reflect an incident light, as for the recurrence reflective section which a position designation means has, it is desirable that the mirror is attached, and preparing near a nose of cam further is desirable. Furthermore,

in order to reflect an incident light in the same orientation as the incident-light way, as for the recurrence reflective section, it is desirable to consider as the structure which has arranged many minute reflecting mirrors which consist of three plane mirrors which are called so-called "cube corner reflector", and which intersect perpendicularly mutually.

[0012] Although a photogenesis means can use various Light Emitting Diodes, its Light Emitting Diode which it is more desirable to use infrared light at the point which prevents the dazzle at the time of an operation, and emits light especially in infrared light (wavelength of about 900nm) is desirable.

[0013] Moreover, "the so-called cylindrical lens" or so-called "toroidal lens" can be used for the optical lens prepared in the position from which it is the front and only the predetermined spacing was separated to the orientation of the light of a photogenesis means. The light emitted in the orientation perpendicular to a coordinate input area side among the light emitted from the photogenesis means by this is condensed in the shape of [parallel to a coordinate input area side] a sector.

[0014] Since only orientation parallel to a coordinate input side should condense as a condensing means by which it is used for an angle detection means when using an optical lens, it is desirable to use the so-called "cylindrical lens." moreover, the transparency which extracts the reflected light to spot light when using aperture as a condensing means -- what is necessary is just to use the aperture with one hole

[0015] PSD (Position Sensitive Light Detector) with the same structure as general photo diode can be used for the photo detector used for an angle detection means. Here, in order that PSD may detect the orientation (angle) of the light condensed by the condensing means with the **** position, the thing of a configuration long and slender in orientation parallel to a coordinate input area side for which it uses-dimensional [of PSDs / 1] is desirable. By the way, PSD is an element which generates the electrical signal which changes with **** positions of light. Since the degree of carrier optic angle of the reflected light from the pen which carries out incidence to the **** position and angle detection means on PSD corresponds to the one for one, if the correspondence relation with the electrical signal which "the degree of carrier optic angle", "the **** position on PSD", and PSD generate beforehand is defined, the degree of carrier optic angle of the reflected light from a pen from the value of the electrical signal directly measured by PSD will be calculated, and it will be further asked for the designation position of a pen by

[0016] Since the light reflected by the pen returns from a photogenesis means conversely through the same optical path as the incidence way of the light by which the outgoing radiation was carried out, although a photogenesis means and an angle detection means approach and it is arranged, really being fabricated in the same **** is desirable so that the photogenesis optical axis of a photogenesis means and the **** optical axis of an angle detection means may be mostly in agreement. You may arrange photogenesis / detection means which consists of a photogenesis means and an angle detection means to a coordinate input area so that both of photogenesis opticals axis and **** opticals axis may turn to the center of abbreviation of a coordinate input area, as described above here. Thus, since photogenesis / detection means is arranged to a coordinate input area, without having the device which carries out the scan of the light, it can be considered as an easy configuration.

[0017] Moreover, since it enables it to specify the position of a pen on the basis of the degree of carrier optic angle detected by the PSD, photogenesis / detection means is required for 2 or more sets. However, although 2 or more sets of photogenesis / detection meanses are needed, if there are at least 2 sets of photogenesis / detection meanses, it is enough, and it is desirable to have 2 sets of photogenesis / detection meanses because of a miniaturization of coordinate detection equipment. Moreover, what is necessary is to see from the center (reference point) of a coordinate input area, to leave only a predetermined spacing and to just be arranged so that it may not exist in this orientation at all when 2 sets of photogenesis / detection meanses are used. The center of a coordinate input area and especially the physical relationship of photogenesis / detection means are not limited, and as described above, when a coordinate input area is a square, they should just arrange 2 sets of photogenesis / detection meanses on two squares which a square adjoins, respectively. Moreover, the above mentioned time-sharing-control means and the above mentioned operation means are realizable with the so-called microcomputer centering on MPU.

[0018]

[Gestalt of implementation of invention] Hereafter, based on the gestalt of enforcement shown in a drawing, this invention is explained in full detail. In addition, this invention is not limited by this.

[0019] The block diagram of one example of the coordinate detection equipment of this invention is shown in drawing 1. Here, the photogenesis detection equipments 2 and 3 are fixed and installed in two angles (k_1 , k_2) which the coordinate input side 1 which is the plate of a square configuration adjoins. Light is discharged on the coordinate input side 1 from these two photogenesis detection equipments 2 and 3. On the other hand, a user points to the arbitrary positions on the coordinate input side 1 with the position designation rod 5, i.e., a pen.

[0020] At this time, the photogenesis detection equipments 2 and 3 detect the light which reflected with the pen 5 among the light emitted from the photogenesis detection equipments 2 and 3, and has returned to the photogenesis detection equipments 2 and 3, and compute the position coordinate of a pen 5. The photogenesis detection equipments 2 and 3 consist of the photogenesis section 2-1, 3-1, and the degree detecting element 2-2 of carrier optic angle and 3-2 using what both has the same configuration. Here, the photogenesis detection equipments 2 and 3 are installed to the coordinate input side 1 so that both of photogenesis opticals axis of the light which emits light from the photogenesis section, and **** opticals axis of the degree detecting element of carrier optic angle may turn to the orientation of the reference point 4 of a coordinate input side. In addition, photogenesis detection equipment is equivalent to the above mentioned photogenesis / detection means, the photogenesis section is equivalent to a photogenesis means, and the degree detecting element of carrier optic angle is equivalent to an angle detection means.

[0021] the orientation of the segment a1 which connects the angle k_1 and the reference point 4 of the coordinate input side 1 in drawing 1, and the segment a2 which connects the angle k_2 and the reference point 4 of a coordinate input side -- the photogenesis detection equipments 2 and 3 -- it considers as each photogenesis optical axis and a **** optical axis Segments a1 and a2 make the angle of the coordinate input side 1 the orientation equally divided to two here at 45 degrees. Moreover, it shall express with X-Y coordinate system which makes the angle k_2 of the coordinate input side 1 a zero (0, 0), sets Y-axis as longitudinal direction and sets the X-axis as lengthwise for the position on the coordinate input side 1.

[0022] The conceptual diagram of the configuration of one example of the photogenesis detection equipments 2 and 3 is shown in drawing 2. Here, the photogenesis section 2-1 and 3-1 consist of the light source (Light Emitting Diode) 6 and an optical lens 7 among photogenesis detection equipments. The cylindrical lens characterized by the thing of an image for which only the scale factor of ** is changed on the other hand, or the toroidal lens characterized by there being no change of an image of the scale factor moreover according [on the other hand, change only the scale factor of **, and] to the degree of incident angle is used for an optical lens 7. Moreover, the degree detecting element 2-2 of carrier optic angle and 3-2 consist of PSD8 and a cylindrical lens 9 among photogenesis detection equipments.

[0023] The light emitted from Light Emitting Diode6 is condensed by the optical lens 7 arranged just before it so that it may become a beam parallel to the coordinate input side 1. That is, as shown in drawing 6, the light of orientation perpendicular to the coordinate input side 1 is condensed so that it may become parallel to the coordinate input side 1 by the optical lens 7, and it is made to become the beam of the shape of a sector still parallel to the coordinate input side 1. Thus, if it condenses with a sector-like beam, since light can be more effectively used compared with the time of not condensing, enhancement in the reliability of a position detection can be aimed at. Here, as Light Emitting Diode6, although light is emitted in a visible ray, L2656 (Hamamatsu Photonics make) which emits light in infrared radiation (wavelength of 890nm) shall be used. Moreover, as an optical lens 7, the length of orientation perpendicular to the coordinate input side 1 is parallel to 10mm and the coordinate input side 1, it is the size whose length of orientation perpendicular to the photogenesis optical axis of infrared light is about 10mm, and a thing with a focal distance of about 6mm is used. Furthermore, it places in a fixed position so that the point of Light Emitting Diode6 emitting light may come to the focal position of an optical lens.

[0024] As shown in drawing 2 , the degree detecting element 2-2 of carrier optic angle and the cylindrical lens 9 which constitutes 3-2 are arranged so that the reflected light from a pen 5 may be condensed in the orientation parallel to the coordinate input side 1. And spot light which condensed is ****ed by PSD8.

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TECHNICAL PROBLEM

[Object of the Invention] However, in some which detect a coordinate position by **** or electromagnetic induction, since the cable which a manufacturing cost is high and connects a pen and a mainframe since it has an electric switch function in a coordinate input side was required, the difficulty was in operability. Moreover, with the conventional coordinate position detection equipment which detects a coordinate position from a scan when carrying out the scan of the beam light and ****ing the reflected light, the device to which the scan of the beam light, such as a motor, is carried out is needed, and the reliability of a position detection is low, and the miniaturization of the whole equipment is difficult. Moreover, by moving a recurrence reflective sheet, the equipment equipped with the conventional photogenesis and the photo detector and this equipment do not direct the spatially distant position, and the coordinate detection equipment which consists of a recurrence reflective sheet arranged in the spatially distant position does not carry out a coordinate detection within a certain fixed flat surface.

[0006] This invention is made in consideration of the above points, and tends to offer the coordinate detection equipment with high small and reliability with an easy configuration in the coordinate detection equipment which directs the coordinate position within a certain fixed coordinate input side with a pen by setting the detection equipment which has 2 or more sets of the photogenesis sections and *****, and arranging a predetermined spacing, without having a scanning device.

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PRIOR ART

[Prior art] Conventionally, as coordinate detection equipment, when a coordinate input side is pressed down with a pen, or when a pen approaches a coordinate input side, there are some which detect an electric change by **** or electromagnetic induction. Moreover, the scan of the laser beam light is carried out, and there are some which detect the coordinate position which detects the reflected light from the mirror with which the pen which directs a coordinate position was equipped, and was directed with the pen.

[0003] For example, it has one pair of pen position detection devices in which a Provisional-Publication-No. 211637 [57 to] official report is made to rotate the pen which prepared the reflective means in the axial point, and a photogenic organ and an electric eye, the scan of the beam light which came out of the photogenic organ is carried out, and the optical coordinate input unit which detects the position of a pen by the orientation which ****ed the reflected light is indicated. Moreover, the optical designation input unit which calculates a designation position from the luminous intensity which equipped a single photogenesis means and its periphery with two or more photo detectors, and the Provisional-Publication-No. 167534 [63 to] official report was made to reflect the light which came out of the photogenesis means with a recurrence reflective sheet (retrospective reflector), and ****ed by the photo detector is indicated.

[0004] In a Provisional-Publication-No. 187329 [63 to] official report, the periphery of the screen of a display position is approached, an infrared linear-light transceiver machine is arranged, and the optical designation input unit which detects the **** position of the return light from a recurrence reflecting mirror (retrospective reflector) with an infrared linear-light transceiver vessel is indicated. Furthermore, the three-dimensions coordinate input unit which is made to carry out the scan of the laser beam to a publication-number 155024 [two to] official report by the rotation mirror, detects the laser beam reflected by the position indicator equipped with the light-reflex spherical-surface field by the light sensitive cell, and detects a position from angle of rotation of that rotation mirror when detecting is indicated.

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TECHNICAL FIELD

[The technical field to which invention belongs] Especially this invention relates to the coordinate detection equipment which detects the coordinate position directed with the pen, in order to carry out an informational input and informational selection in a personal computer etc. about coordinate detection equipment. This coordinate detection equipment is unified and used with a media board or a large-sized display.

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DETAILED DESCRIPTION

[Detailed description]

[0001]

[The technical field to which invention belongs] Especially this invention relates to the coordinate detection equipment which detects the coordinate position directed with the pen, in order to carry out an informational input and informational selection in a personal computer etc. about coordinate detection equipment. This coordinate detection equipment is unified and used with a media board or a large-sized display.

[0002]

[Prior art] Conventionally, as coordinate detection equipment, when a coordinate input side is pressed down with a pen, or when a pen approaches a coordinate input side, there are some which detect an electric change by **** or electromagnetic induction. Moreover, the scan of the laser beam light is carried out, and there are some which detect the coordinate position which detects the reflected light from the mirror with which the pen which directs a coordinate position was equipped, and was directed with the pen.

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[0005]

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detects a coordinate position from a scan when carrying out the scan of the beam light and ****ing the reflected light, the device to which the scan of the beam light, such as a motor, is carried out is needed, and the reliability of a position detection is low, and the miniaturization of the whole equipment is difficult. Moreover, by moving a recurrence reflective sheet, the equipment equipped with the conventional photogenesis and the photo detector and this equipment do not direct the spatially distant position, and the coordinate detection equipment which consists of a recurrence reflective sheet arranged in the spatially distant position does not carry out a coordinate detection within a certain fixed flat surface.

[0006] This invention is made in consideration of the above points, and tends to offer the coordinate detection equipment with high small and reliability with an easy configuration in the coordinate detection equipment which directs the coordinate position within a certain fixed coordinate input side with a pen by setting the detection equipment which has 2 or more sets of the photogenesis sections and *****s, and arranging a predetermined spacing, without having a scanning device.

[0007]

[The means for solving a technical problem] This invention is equipped with 2 or more sets of photogenesis / detection meanses which consist of a position designation means to have the recurrence reflective section, and an angle detection means to detect the degree of carrier optic angle of the reflected light reflected through a photogenesis means and the aforementioned recurrence reflective section. Contiguity arrangement of the photogenesis means and the angle detection means of constituting one photogenesis / detection means is carried out so that both of each optical axis may turn to the center of abbreviation of a coordinate input area. 2 or more sets of photogenesis / detection meanses provide the circumference section of a coordinate input area with the coordinate detection equipment with which it is characterized by setting a predetermined spacing and being arranged mutually.

[0008]